American Forest & Paper Association
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REGULATORY AFFAIRS

May 7, 1998

To: Prospective Researcher

In 1994, the American Forest & Paper Association (AF&PA) released "Agenda 2020: A Technology Vision and Research Agenda for America's forest, Wood, and Paper Industry." That document described in general the research needed by the forest products industry to allow it to pursue a sustainable future. Since then the Agenda 2020 Energy Performance Research Task Group has identified a number of specific high-priority energy research areas needing additional study.

At the request of the AF&PA Energy Performance Research Task Group, we are writing to you requesting two-page proposals for research to be funded in October 1999 for federal fiscal year 2000. The two page proposals must be received by August 1, 1998.

There are three attachments included with this letter.

1. Proposal Submittal and Selection Process for Federal Fiscal 2000.
2. Nine Energy Performance Areas Targeted for Federal Fiscal 2000.
3. The Preproposal Form.

The Energy Performance Task Group strongly encourages proposals submitted as a result of collaboration or alliances among varied organizations (such as collaboration among universities; among universities and the industry and/or its suppliers; among universities and national laboratories; etc.).

Late proposals or those not meeting attached criteria will not be considered. We look forward to your response.

Patricia Layton
Interim Director, Energy Policy

ATTACHMENT 1

PROPOSAL SUBMITTAL AND SELECTION PROCESS FOR 1998

- Two- page (single-sided) preproposals using the form attached must be received by August 1, 1998. **Proposals must be typed in a 10 pitch type font or larger. Late proposals or proposals more than two pages will not be considered**.

- The best of these proposals will be selected using the criteria listed below in October. Selected researchers will be requested to prepare a final 5-page proposal.

- Those requested to prepare a final 5-page proposal will be invited to participate in a poster session describing their proposal. This session will be held in early December 1998.

- The 5-page proposals must be received on February 1, 1999. **These proposals must include identification of the specific sources of at least 20% cost shared funding**.

- The Energy Task Group will review these proposals, and make recommendations to the AF&PA Chief Technology Officers Working Group in early April 1999.

- In making selections, the Task Group will use the following eight criteria:

    1. Relevance of the proposal to the topics identified in the targeted areas.

    2. Clarity of the objectives.

    3. General scientific and technical quality, including evidence that the researcher is familiar with previous work done in the chosen area.

    4. Probability of achieving the objectives within the identified time and requested resources.

    5. Quantification of net benefits to the industry should the research yield promising results.

    6. Innovation (either in terms of providing improved fundamental understanding that could lead to solving an important problem or suggesting a new approach to solving an important problem.)

    7. Collaboration with the forest, wood, and paper industry, including industry participation through direct funding or in kind contributions.

    8. Probability of commercial application.

- Submissions must include 20 copies of both two and five-page proposals.

- Proposals are to be sent to:

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ATTACHMENT 2

TARGETED ENERGY PERFORMANCE AREAS FOR 1999

In the following material you will find discussions of the topics on which the American Forest & Paper Association Energy Performance Research Task Group is interested in receiving preproposals. Please identify the number and title of your targeted area(s) when submitting your proposal.

1. Precompetitive research to create, develop, and demonstrate new approaches to drying and water removal.

Water removal and drying are processes common to the manufacture of pulp and paper and wood products. Such processes include, but are not limited to, concentration of spent pulping liquor prior to firing in a chemical recovery furnace, water removal in paper manufacturing, drying fiber strands in the manufacture of oriented strand board, kiln drying of lumber and use of residual materials and biomass as fuel. Process developments are needed which result in greater energy efficiency in existing or new processes to produce products which perform the same or have similar functions as products made today. Consideration in this research must be given to the capital and cost effectiveness of possible developments, the environmental impact, and any effects on product characteristics. Research proposals may focus on one or several steps of one or more processes, but the anticipated result should lead to substantially less energy use associated with a product's manufacture and use on a cradle-to-grave basis.

2. Precompetitive research into energy efficient processes to collect and use recovered paper.

More than forty percent of the paper used in the United States is now recovered for reuse as raw material in paper manufacturing and other processes. The AF&PA has a goal of fifty percent recovery. Manufacture of many grades of paper from recovered paper requires the use of more fossil fuel than the manufacture of similar grades from wood. As a larger proportion of paper is recovered, the quality of the collected paper may decline, and contamination levels are likely to increase, requiring more energy to prepare the recovered paper for reuse. Alternative uses for recovered paper are many, including use as a prepared fuel. The precompetitive research needed for development of cost effective techniques may include, but is not limited to, development of effective collection methods, effective separation techniques, enhanced energy efficient deinking, improved energy-efficient papermaking specifically utilizing recovered fiber, effective fuel preparation and use, particularly as an auxiliary fuel, and new energy-efficient uses of recovered paper.

3. Commercialization of combined-cycle gasification technologies for both black liquor and biomass.

The industry is looking for a path forward which makes a cost-effective, proven, combined cycle gasification technology available for industry use as quickly as practical to provide an alternative to replacing an aging fleet of both recovery furnaces and conventional power boilers. Competitive development of combined cycle, gasification technologies (for both black liquor and biomass feedstocks) is well underway, with successful pilot demonstrations already being reported. Scale-up to commercial scale is the principal hurdle blocking the industry's path forward since the capital intensity and risk associated with first demonstration is typically more than a single operator can absorb. Any proposal should address how the capital intensity and risks of commercial demonstration will be minimized. Georgia Pacific, Champion International and Weyerhaeuser have already announced projects incolving three different technologies in three different applications. Summaries of these projects are included as Attachment 4. Other project proposals, which are supportive of the industry’s needs underlying this initiative, are encouraged.

The technical gaps to commercialization for the two feedstocks are understood to be:

Black liquor gasification -- For systems employing cold gas clean-up, the key gaps are physical scale-up of the gasification processes under development and commercial demonstration of the combined gasification and combustion processes. For systems using low-temperature gasification, destruction/removal of tars and other condensables is also an issue and must be proven on a pilot scale. For systems with hot gas clean-up, the clean-up system itself must be added as a serious technology gap.

Biomass gasification -- The key gaps are demonstration of tars and condensable organic compound clean-up, physical scale-up and commercial demonstration of the integrated gasfication and combustion combined cycle systems.

4. Precompetitive research that will increase fundamental understanding of the process in the Tomlinson furnace, ultimately leading to optimization of its performance.

There are about 220 Tomlinson recovery furnaces in operation in the United States with a combined energy capacity of approximately 50 GW. Expenditures on recovery furnaces represent about 20% of the total capital in integrated Kraft pulp and paper mills. Incremental improvements in recovery furnace operation could lead to substantially enhance economic performance (higher capacity, better energy efficiency, less emissions) and significant reductions in the mill's need for energy from other sources.

The recovery furnace serves a dual function, generating steam from the heat of combustion of the organic constituents of black liquor, and recovering the inorganic chemicals (primarily sulfur and sodium) from the pulping process. This dual function makes the design and operation of a furnace much more complicated than that of a traditional conventional fuel power boiler. While substantial fundamental process knowledge exists, basic research building on what has been done already is still needed to further the understanding that will lead to improved economic, environmental and operational performance. Specific areas of interest include, but are not limited to, process aspects such as combustion, pyrolysis and char bed chemistry, black liquor properties, fume formation, heat and mass transport processes, deposition and fouling, and process control.

5. Precompetitive research to understand the fundamental physico-chemical behavior of non-process elements (NPEs) in recovery area process streams. This knowledge should lead to mill closure/NPE model development and treatment technologies for NPE removal.

Internally recycling effluent waste streams in the Kraft process (closed-cycle operations) reduces both the water makeup and the effluent discharge of the mill. However, closing the mill creates many operational problems, the most significant being the concentration of non-process elements (NPEs) in process streams. NPEs (K, Ca, Mg, Al, Si, Fe, MN and C1 are of primary interest) usually enter the pulp process as trace constituents of wood or make-up chemical. They currently leave the mill through a variety of effluent purge locations. As the volume of those purges is reduced, the concentration of NPEs inevitably will rise. The anticipated use of energy to achieve these ends needs qualification.

Research is needed to:

1. Understand the partitioning behavior of NPEs in the recovery cycle. This will enable development of models that will predict NPE concentrations under different closure scenarios.

2. Understand the effects of higher concentrations of NPEs on recovery area performance, especially as they relate to the issues of scaling, corrosion, boiler efficiency, effluent toxicity, and process chemistry.

3. Develop technologies to selectively remove and dispose of NPEs from recovery area process streams.

6. Precompetitive research into fundamental mechanisms and new processes for recovering and converting residuals into high-energy-density fuels.

As the industry continues to make progress in the recycling of paper and wood and in recovering more residuals from plantation and tree farms in an environmentally acceptable and sustainable way, increased knowledge of the characteristics of residuals and new and improved process for recovering them and converting them at the source will become essential. Many residual materials will be generated in locations increasingly remote from the site of their potential use as feedstocks for pulp, paper, wood, chemical or energy products. Processes that will allow these materials to be converted at the source to increase density and improve handling and transportation will become very important. In many situations, these processing systems must be mobile and in the case of forest residuals will have to include methods for returning essential elements and nutrients to the soils to ensure sustainable operations. Fundamental and applied research in the areas of recovery, material characterization, cleaning and separation, densification, conversion to more convenient new material or fuel forms, transportation and storage will be needed in order to stimulate the development of new techniques, equipment and systems for enabling the maximum recovery of residual materials to the highest value use in a sustainable, economical and environmentally-sound manner.

7. Precompetitive research into concepts and systems for economical low-level heat recovery.

The thermal efficiency of existing wood processing and pulp and paper manufacturing facilities is adversely affected by the creation of low-level heat in gaseous and liquid streams at too low a temperature to be useful as a heat source for most process operations. While modern design techniques and a whole system approach to mill design can help minimize the development of excess low-level heat in a new facility, it often is presently infeasible economically to retrofit existing facilities to minimize the development of excess low-level heat. In such instances, the desired alternative is to economically upgrade the low-level heat to a level at which it can be recovered and used. Existing systems for low-level heat recovery are capital intensive and high in operating cost, limiting their operation. Therefore, precompetitive research is needed into concepts and systems for the economical recovery of energy contained in low-level heat sources.

8. Precompetitive research in energy efficient pulping, bleaching and recovery processes and in the manufacture of engineered wood products.

This research is focused on the disassembly of biomass to fibers and the reassembly of strands, chips, or veneer to solid wood products. The goal is to accomplish these processes in an energy efficient manner. Possible techniques can employ biological, chemical or physical processes. Standards of comparison for energy use should be present or developing processes and proposed savings should be significant.

9. Precompetitive research to develop alternatives to combustion as a pollution control mechanism.

Fundamental research is needed to develop alternatives to combustion or incineration of airborne emissions created during the pulping and wood products manufacturing process. Non-condensible gases that are untreated in odorous gas system are typically disposed of in mills by burning them in power boilers, lime kilns, or dedicated thermal oxidation systems using fossil fuels. The offgases from certain scrubbers in the mills are also typically combusted as an emission control measure. Elimination of volatile organic compounds from wood products manufacturing by non combustion methods is also a focus. Research is needed to develop ways of treating both the non-condensible gases produced in the pulping process and scrubber offgases as well as in wood products systems by non-combustion techniques.

ATTACHMENT 3

TWO-PAGE PROPOSAL SUBMITTAL FORM

TARGETED PROPOSAL AREA

PROJECT TITLE

PRIMARY INVESTIGATOR AND COLLABORATORS:

BACKGROUND:

OBJECTIVES:

TWO-PAGE PROPOSAL SUBMITTAL FORM (CONT.)

GENERAL EXPERIMENTAL APPROACH:

QUANTIFIED NET BENEFITS TO THE INDUSTRY SHOULD THE RESEARCH YIELD PROMISING RESULTS:

APPROXIMATE SCHEDULE:

APPROXIMATE BUDGET AND SOURCES OF FUNDING FOR YEAR ONE AND OVERALL:

ATTACHMENT 4

Battelle/Ferco LIVG Gasification System
Weyerhaeuser Mill in New Bern, North Carolina

For many years, Weyerhaeuser has evaluated and encouraged the development of biomass gasification combined cycle technology in general and, in particular, the technology developed by Battelle Memorial Institute and currently licensed to Future Energy Resources Company (FERCO). This technology is being piloted at the 200 BDT/day size at the McNeil Power Station in Burlington, Vermont. As part of a DOE feasibility study, Weyerhaeuser is participating on the Burlington Project Team with the objective of helping that demonstration to be successful as well as providing efficient technology transfer for the first commercial scale demonstration facility being evaluated for construction at Weyerhaeuser's mill in New Bern, North Carolina.

The New Bern market pulp mill represents a unique opportunity for this demonstration in that its incremental thermal energy is supplied by #6 and #2 oil. The mill has had a long history of interest and activity in the gasification area, and currently operates the world's largest black liquor gasification system. The knowledge and experience that has been achieved from the mill's activities with gasification--coupled with its dependence on oil as an incremental fuel and its high power costs--provides a unique opportunity for the effective demonstration of the Battelle/FERCO technology.

The current feasibility study will be concluded in early 1999; and if this study continues to look positive, a capital implementation will be considered in the 1999-2000 time frame. As with all first-of-a-kind demonstrations of this size (~700 BDT/day) the risk to the mill will have to be reduced through participation by Federal grants. The project is anticipated to cost ~$40,000,000 and will require ~50% cost share from the Federal government.

Kvaerner/Chemrec Pressurized Black Liquor Gasification System
Champion International Mill in Courtland, Alabama

The Champion International mill at Courtland, Alabama is faced with the need to rebuild its oldest recovery boiler to comply with MACT II regulations and has the opportunity to improve its energy efficiency and short-term capacity needs. The mill offers unique infrastructure advantages for the demonstration of the oxygen-based black liquor gasification system supplied by partnership of Kvaerner Chemrec and Air Products. These advantages include an existing gas turbine, a power boiler with sulfur cleanup, two vessel digesters and an existing oxygen pipeline. These features will uniquely allow for a staged commercial demonstration of the technology in a manner that will minimize the capital cost and risk.

The 600 ton/day black liquor solids project is anticipated to cost ~$60,000,000 over 4 years, beginning in 1999. Champion and its supply partners are positioned to provide 50% of the project cost.

MTCI PulsEnhanced™Steam Reforming Process
Georgia Pacific Mill in Big Island, Virginia

The Georgia Pacific Big Island, Virginia mill represents an ideal facility for a gasification demonstration project utilizing the pulsed enhanced steam reformer technology offered by MTCI of Baltimore, Maryland. The Big Island mill is a semi-chem caustic/carbonate facility similar in characteristics to 12 other mills in the U.S. producing virgin medium for containers. The replacement of smelters and fluid bed units with this new technology will provide an energy recovery opportunity currently not present at the facility. The no-sulfur chemistry will provide a low risk demonstration opportunity for the technology. Conditions present at the facility will provide a high probability of success and demonstrate the benefits for the other 12 semi-chem mills, as well as contributing significantly to the technology's implementation in a much larger number of kraft mills. It is felt that this simplified application has the highest probability of successfully advancing the MTCI technology.

Of the several types of gasifier technologies, the "pulse enhanced steam reformer" is preferred because the black liquor is converted to gas without the presence of air or oxygen. In addition, it may be possible to run a gasifier at Big Island without refractory materials in the firing chamber. This would eliminate a source of problems which has caused high downtime on other gasifiers. Also, fewer metallurgy problems are expected because no sulfur is added to the Big Island process. Successful pilot trials have been conducted firing Big Island black liquor for 108 continuous hours in the steam reformer gasifier in MTCT's Baltimore, Maryland facility.

Given that this installation will represent the first time this technology will be used for full mill recovery on black liquor, there is obviously significant commercial risk. The project is anticipated to cost ~$22,000,000 and will require ~50% funding from Federal sources, as well as permit modifications to allow the demonstration the necessary flexibility to be successful.